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(58) Field of search

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(54) Multipurpose adhesive

(57) Pressure sensitive adhesive formulations comprise (1) 5 to 20% butadiene//styrene elastomer or styrene/isoprene/styrene block polymer, (2) 5 to 20% thermoplastic petroleum hydrocarbon resin and (3) aromatic hydrocarbon and/or chlorinated hydrocarbon solvent. The formulations may also contain a vinyl acetate polymer and/or pressure sensitive acrylic resin.

MULTIPURPOSE ADHESIVE
BACKGROUND OF THE INVENTION

The present invention relates generally to an improved adhesive formulation, and more particularly to a solvent-based adhesive which may be applied to a variety of surfaces through a variety of application techniques or systems, and which is capable of forming a bond with highly desirable adherent and coherent properties. Furthermore, the adhesive may be dried or otherwise subjected to a solvent removal step so as to form a film of a dry surface having pressure adhesive characteristics. In this connection, once the solvent has evaporated from the film-forming formulation, the residual film, while being highly adherent to the surface upon which it was applied in liquid form, possesses sufficiently high cohesive strength so as to render the dried film releasable from a surface to which it has been applied under pressure. Application techniques are wide and varied, and may include brush application, spray application, as well as application through a container having a saturated swab or dabber on one end thereof.

In the preparation of adhesive formulations, it is generally desired that the adhesive layer, particularly when in film form, have appropriately matched adhesive and cohesive properties. Normally, these properties are sufficiently closely matched so that the bond which is

formed by the adhesive material preferably fails due to simultaneous failure of both its adhesive and its cohesive properties. At the same time, it is generally desirable that the adhesive possesses a relatively low peel strength. The formulations of the present invention, by contrast, are designed to possess sufficiently high cohesive strength so as to provide for failure of its adhesive property, thereby rendering the materials of a type which fail primarily in their adhesion mode. Films having such properties are particularly desirable for the temporary attachment of materials to surfaces such as walls or floors, with the adhesive films of the present invention being particularly desirable for use in mounting lightweight materials or items such as posters to wall surfaces, and also highly desirable for adhering floor coverings such as carpeting, throw rugs, or the like to floor surfaces. The release properties of the adhesive film enhance and/or widen the scope of uses for products prepared in accordance with the present invention.

SUMMARY OF THE INVENTION

The formulations of the present invention accordingly have utility as adhesive materials, and may be formulated so as to permit applying the material by various techniques such as brush, dipping, aerosol spray, or applicator with a roller top or pad. Because of the

wise variety of application techniques, and particularly because of the extremely high cohesive strength of the films, the formulations may find wide usage and application. The distinctions in the individual formulations are indicated by the application technique or mode desired, with these distinctions being based primarily upon differences in the adhesive solids content and to a lesser extent upon the specific solvent selected.

In actual use, the adhesive formulations of the present invention may be applied to two or more surfaces to be bonded prior to the removal of the solvent, or while the adhesive formulations are solvent rich or otherwise highly laden with liquid. The preferred application technique in these instances is through the applicator bottle. In these instances, the adhesive strength of the bonds which are formed are sufficiently high so as to provide a firm solid bond between surfaces to be joined together. Alternatively, the adhesive formulation may be applied to a surface, and the solvent permitted to evaporate therefrom. Upon evaporation of the solvent, the adhesive formulation dries and a film is formed with a substantially dry outer surface. The article carrying this film may thereafter be forced against a second surface, and the film which has been formed provides a pressure sensitive bond to the second surface. If the surface of the adhesive film is

maintained reasonably free of contaminating solids, the article carrying the adhesive film thereon may be removed from the second surface, and repeatedly applied or re-secured on a number of occasions. In other words, the pressure sensitive adhesive characteristics of the film are preserved, and multiple attachment and detachment operations may be undertaken with the film.

Because of the surface characteristics of the adhesive formulation, the material is particularly useful when it is desired to hold various items in place so as to provide a non-slip or anti-skid surface. Thus, the material dries to a film which is tacky by nature, but which nevertheless provides a good gripping action. It is further noteworthy that the dried film neither picks up dirt or other solid particles, nor does it transfer from the surface to which it is initially bonded when drying is substantially complete. The adhesive coating is further desirable from the standpoint of its reasonable ability to withstand exposure to water, including water containing detergents or the like. Thus, the material may be applied to the undersurfaces of throw rugs and mats, which can thereafter be laundered without complete removal of the film coating. Furthermore, because of the nature of the film, when the gripping action diminishes and otherwise weakens, additional coats or layers may be applied.

The adhesive material is accordingly desirable to enhance traction in areas surrounding swimming pools and boat decks. Since the gripping surface is partially diminished in the presence of water, the surfaces should reasonably be maintained in as dry a condition as possible.

Briefly, in accordance with the present invention, a solvent mixture of adhesive solids is prepared, with the solvent mixture containing solids consisting generally of a mixture of synthetic thermoplastic rubber formed of a series of alkyl-aromatic thermoplastic hydrocarbon resins, essentially a styrene butadiene elastomer or a styrene/isoprene/styrene block copolymer, along with a quantity of a thermoplastic hydrocarbon resin derived from petroleum. The formulation further contains a vinyl acetate polymer to provide the desirable surface properties of the adhesive formulation. The solvent mixture is one selected from the group consisting of chlorinated hydrocarbon solvent, and a mixture of low boiling aromatic petroleum fractions such as mineral spirits. These solvents are compatible with the adhesive formulations, and are selected for the evaporation rate desired. The best overall properties of the adhesive formulation are achieved when fast-drying chlorinated and aromatic solvents are employed.

Therefore, it is a primary object of the present invention to provide an improved adhesive formulation which has good adherent properties, but at the same time possesses unusually high cohesive shear strength so as to permit use as an anti-skid film.

It is yet a further object of the present invention to provide an improved adhesive formulation which is solvent based, and which adheres well to surfaces when wetted with the solution, and which provides a pressure sensitive bond to surfaces upon drying of the adhesive.

Other and further objects of the present invention will become apparent to those skilled in the art upon a study of the following specification and appended claims.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In order to explain the features of the present invention, the following examples and formulations are given.

EXAMPLE I

<u>Component</u>	<u>Percent by Weight</u>
Solvent mixture of aromatic and chlorinated solvents	70%
Styrene/isoprene/styrene block copolymer consisting essentially of 2-methyl-1,3-butadiene	15%
Thermoplastic hydrocarbon resin of lower alkyls derived from petroleum in solution form	14%
Trichloroethylene solvent	1%

GENERAL EXAMPLE

By way of a general example, the following
formulation is given:

<u>Component</u>	<u>Percent by Weight</u>
Solvent mixture of aromatic and chlorinated solvents	70%
Styrene/isoprene/styrene thermoplastic resin	15%

Alkyl aromatic thermoplastic hydrocarbon resin	14%
Pressure sensitive acrylic resin	1%

With respect to the individual components of the formulations, the solvent mixture is one which has a relatively low boiling point, particularly a boiling point which is less than approximately 180oF. Mineral spirits, for example, should be of the refined mineral spirit variety wherein at least 90% boils at a temperature of 180oF. or less. Such solvent mixtures are, of course, commercially available.

The styrene/isoprene/styrene block copolymers are commercially available. Specifically, these materials are available from Shell Chemical Company of Houston, Texas under the trade designation "Kraton 1107". This material may be included in the working formulation in an amount ranging from between about 5 percent and 20 percent by weight.

The thermoplastic hydrocarbon resin, specifically in the form of thermoplastic hydrocarbon resin of lower alkyls derived from petroleum in solution form is also available commercially. These components are produced from unsaturated lower alkyls generally from between 5 and 20 carbon atoms in the chain. These materials may

have a relatively large range of molecular weights and physical property grades, and all are available commercially from Hercules Inc. of Wilmington, Delaware. This material may be included in the formulation in an amount ranging from between about 5 percent and 20 percent by weight.

The vinyl acetate polymer materials are also commercially available. One source of such vinyl acetate resins is Monsanto Co. of St. Louis, Missouri, with the materials being available under the trade designation "Gelva 263". This material may be included in the formulation in an amount ranging from between about zero percent and 5 percent by weight.

CLAIMS

1. An adhesive formulation for secure but releasable bonding attachment of two surfaces and comprising a highly cohesive solvent-based adhesive mixture for wettable attachment to a surface and for secure but releasable tack bonding of the wetted surface to a second surface and comprising a working solution of the following formulation:

<u>Component</u>	<u>Percent by Weight</u>
Solvent mixture selected from the group consisting of aromatic and chlorinated solvents	70%
Styrene/isoprene/styrene block copolymer selected from the group consisting of 2-methyl-1,3-butadiene and 3-methyl-1,3-butadiene	5 to 20%
Thermoplastic hydrocarbon resin of lower alkyls	5 to 20%
Trichlorethylene solvent	0 to 5%

said working solution being flowable upon a first surface to which it is applied and having solvents therein evaporating in the ambient at a rate sufficient to form a film having a substantially dry outer surface and which remains securely adhesively bonded to said selected surface while having its said outer surface arranged for releasable pressure bonding upon a second surface to which said film is forceably applied.

2. An adhesive formulation according to Claim 1 including 0 to 5% by weight of vinyl acetate polymer.

3. The adhesive formulation as defined in Claim 1 or 2 being particularly characterised in that said solvent is a chlorinated hydrocarbon having a boiling point less than about 180°F at standard conditions.

4. The adhesive formulation of Claim 1, 2 or 3, comprising 15% of the block copolymer and 14% of the thermoplastic resin.

5. The adhesive formulation of any preceding claim, wherein the thermoplastic resin is an alkyl aromatic hydrocarbon resin.

6. In combination, an adhesive formulation according to any preceding claim and an applicator bottle including an enclosed container having an open top, and with a permeable dabber therein, and being permeable to the said adhesive formulation.